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ABSTRACT

The development of the removal of rigidity in library classification is traced from the Enumerative Classification of DC (1876) through the Nearly-Faceted Classification of UDC (1896), the rigidly, though fully faceted version of CC (1933), the generalized faceted structure of version 2 of CC (1949), down to the Freely Faceted Classification of version 3 of CC (1970). The separation of the three planes of work classification -- idea, notational, and verbal -- and its conscious application is indicated. Mention is made of the advantage of recognising modes of formation of new subjects and isolates. The concept of compound isolate created by the Law of Parsimony is described. The atomisation of subjects in the Universe of Subjects make it obligatory for library classification to be based on a sound dynamic theory of classification in each of the three planes. For documentation search, the replacement of the general purpose computer by a special purpose electronic doc-finder is commended. To make the investment on electronic machinery pay back more than itself and to secure noise-free, leakage-free result of search, a continuous improvement in the theory and in the design of a scheme for classification is an absolute necessity. (Author/KE)

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RANGANATHAN MEMORIAL ISSUE

IMPACT OF GROWTH IN THE UNIVERSE OF SUBJECTS ON CLASSIFICATION

by S. R. Ranganathan

RANGANATHAN, THE MAN AND HIS WORKS:
View Through a Bibliography

by Bernard I. Palmer *

DANISH CENTRE FOR DOCUMENTATION
Copenhagen 1972

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FID/CR
Dec. 1972

EDITORIAL

On 27th September 1972 Prof. S. R. Ranganathan passed away at his residence in Bangalore after a brief illness.

Dr. Ranganathan's association with FID goes back more than 25 years when Mr. Donker Duyvis requested him to contribute a paper on Documentation for the FID bulletin. He served as a Vice-President of the FID Council for a number of years; later on he was elected Honorary Fellow of FID.

In 1950 Dr. Ranganathan founded the FID/CA Committee on Classification Theory, propounding classification research during the initial stages at every FID Meeting and the Dorking Conference in 1957, up to 1962 when he was elected Honorary Chairman of FID/CR. — He was a most trustworthy, and until the end, speedy, co-operator of our Group: contributing No. 1 of the FID/CR Report Series, the Presidential Address and two papers to the Elsinore Conference in 1964, vital and stimulating criticism of Seminar Reports and papers, and so forth. I know how his travelling in Europe and U.S.A. after Elsinore was influencing leaders of computerized classification projects, even within industrial firms. A number of special, faceted classification schemes, based on Ranganathanian principles, was developed during the fifties; earliest of these the SfB-system, internationally authorized by the Conseil International du Bâtiment (CIB) and now used in more than 20 countries. Moreover, Classification Research Groups were established in several countries as a result of his inspiration.

Dr. Ranganathan meant a new approach to classification theory; therefore, his contributions in the field of classification are outstanding and unique. Among all his friends of the West I think the Members of FID/CR will remember him not least for his initiative within FID in bringing us together.

Report No. 12 presents first a recent manuscript of Ranganathan's, and next by courtesy of Mr. B. I. Palmer a reprint of an essay in Ranganathan's works and personality, originally published in *Library Science with a Slant to Documentation*, vol. 6, 1969.*

As the FID/CR Secretariat from January 1973 will be placed with the DRTC in Bangalore, under the auspices of the Indian National Member of FID (INSDOC), thanks are due to the President of the Danish Centre for Documentation, Mrs. Vibeke Ammundsen, for the encouragement and excellent working conditions extended to the said Secretariat over a period of ten years.

Rasmus Mölgaard'H

* ERIC User Note: The Palmer article has not been included on this microfiche. See original journal.

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b. 12 Aug. 1892; ed. Madras Christian Coll., Teachers' Coll., Saidapet, and Univ. Coll., London. — Lecturer in Mathematics, Govt. Colls. of Madras 17—20; Asst. Prof. of Maths., Presidency Coll., Madras 21—24; Univ. Librarian Madras 24—44; Univ. Librarian and Prof. of Library Science, Benares Hindu Univ. 45—47; Prof. of Library Science, Univ. of Delhi 47—55; Chair. Libraries Cttee., Univ. Grants Comm. 58, working party Science Planning Comm. 59; Dir. Seminars on Work-Flow in Univ. Libraries 59; Social Service Documentation 59; Visiting Prof. of Library Science, Vikram Univ. 57—59; Prof. Documentation Research and Training Centre, Bangalore 62—64; Nat. Research Prof. in Library Science 65—; founded Sarada Ranganathan Chair of Library Science, Madras Univ. 57; established Sarada Ranganathan Endowment for Library Science 63.

IMPACT OF GROWTH IN THE UNIVERSE OF SUBJECTS ON CLASSIFICATION

by Dr. S.R. Ranganathan, National Research Professor
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The development of the removal of rigidity in library classification is traced from the Enumerative Classification of DC (1876) through the Nearly-Faceted Classification of UDC (1896), the rigidly, though fully faceted version of CC (1933), the generalised faceted structure of version 2 of CC (1949), down to the Freely Faceted Classification of version 3 of CC (1970). The separation of the three planes of work of classification -- idea, notational, and verbal -- and its conscious application is indicated. The emancipation of the idea plane from inhibition by the verbal plane and notational plane is pointed out. Mention is made of the advantage of recognising the following modes of formation of new subjects and isolates: Loose assemblage, Lamination, Denudation, Fission, Fusion, Distillation, Partial Comprehension, and Subject Bundle. The concept of compound isolate created by the Law of Parsimony is described including the concept of special component for compound isolates, not capable of being by itself an isolate. The atomisation of commodity production in industry and the resulting unlimited atomisation of subjects in the Universe of Subjects make it obligatory for library classification to be based on a sound dynamic theory of classification in each of the three planes. For documentation search, the replacement of the general purpose computer by a special purpose electronic doc-finder is commended. To make the investment on electronic machinery pay back more than itself and to secure noise-free, leakage-free result of search, a continuous improvement in the theory and in the design of a scheme for classification is an absolute necessity.

0 Introduction

01 Decimal Classification (1876)

Decimal Classification was a heroic first step in the field of classification. It should have arisen out of a full realisation of the unsuitability of the words in any natural language to form the basis for the arrangement of Subjects helpful to the majority of readers. Its unsuitability is due to the natural language growing, as it were, in the lips of the man in the street. This led to instability in the meaning of words and to the presence of many homonyms and synonyms. These causes are trivial when compared with the fact that the arrangement of subjects alphabetically by their names, totally defying helpful sequence of subjects. As a first means of escape from this difficulty in the verbal plane, Decimal Classification transferred the naming of subjects to the notational plane. But its attempt to enumerate all possible subjects and to provide a monolythic schedule to represent them caused great rigidity.

02 Universal Decimal Classification (1896)

This rigidity was partially sensed by UDC. It sought to remove the rigidity by the veneering of DC with Time and Space Common Isolates; and in certain subjects it provided also for special isolates called "Analytical Divisions". But the rigid core of DC was virtually adopted. There was also provision for coloned numbers, as another means of removing rigidity. The result was seen in the notational plane as an addition to the Indo-Arabic numeral of DC -- some non-numeral digits for use as indicator digits -- indicating the nature of the succeeding numbers forming the veneer.

03 Colon Classification Version 1 (1925)

But by 1925, the Universe of Subjects began to develop in ways beyond the power of the notational system of UDC. Therefore, CC started in quite a new way. It viewed a subject as capable of being analysed into Basic Subject and Isolates -- some common and some special. It, therefore, adopted the method of providing schedules only for Basic Subjects, Common Isolates, and Special Isolates. It depended upon the synthesis of the appropriate Basic Subject Number and Isolate Numbers to form the Class Number of a subject. For this reason, CC was described as Analytico-Synthetic. A subject involving isolates was called a Compound Subject in contradistinction to a Basic Subject. Further, a subject expressing a relation between two subjects was called a Complex Subject. In the notational plane, CC introduced the letters of the Roman alphabet in addition to the numerals. It also introduced the digit ":" (colon) as an Indicator Digit to synthesise the Isolate Numbers of a Compound Subject. Later it came to be called a "Faceted Scheme".

04 Colon Classification Version 2 (1949)

Within another quarter of a century the further development of the Universe of Subjects laid bare the rigidity of Version 1 of CC. This rigidity was traced to a pre-determined facet structure being imposed on every Compound Subject. This allowed neither the introduction of any new facet nor the omission of any prescribed facet. This in its turn was partly traceable to the development of literary warrant in subjects with more facets than were found sufficient about a quarter of a century earlier. To meet the situation, work on the theory of classification led to the concept of the Five fundamental Categories: Personality, Matter, Energy, Space, and Time (PMEST), of Rounds of isolates and of Levels of isolates in any Round. This led to a generalised facet structure. The single Indicator Digit ":" (colon) gave place to the use of other punctuation marks also as Indicator Digits. Each punctuation mark indicated the particular fundamental Category of which the succeeding isolate was deemed to be a manifestation (7).

05 Colon Classification Version 3 (1961)

Within a decade a rigidity in CC Version 2 was laid bare by the literary warrant developing for subjects involving Space and Time isolates at different levels. This rigidity was traced to the same Indicator Digit "." (dot) being used to indicate Space as well as Time isolates. This confined the Indo-Arabic numeral sector to represent Space isolates only and the Roman capital sector to represent Time isolates only. This rigidity was removed by the use of a -'- (single inverted comma) as the Indicator Digit for Time isolate (5).

1 Separation of the Work in the Theory of Classification into Three Planes

The above mentioned casual attempts at removing rigidity were vaguely felt to be insufficient even as early as 1944. The need was realised for a dynamic theory of classification to guide the classificationist in his work. While starting work on such a theory of classification, a glimpse was got on the desirability and possibility of separating the work of classification in the three planes -- Verbal, Notational, and Idea Planes. A better grasp of this idea was got successively from 1952 onwards. It was possible to state it clearly and to bring it into conscious operation in 1967. The political weapon of "Divide and Rule" has turned out to be effective in this area too.

2 Benefit of the Separation of Work in the Three Planes

This separation of planes of work made it possible to isolate and solve independently, in the first instance, the problems arising in each of these three planes. This made possible considerable progress in the theory of classification. At suitable stages, the results of the works in the three planes are correlated. This has given full freedom for the theory in the Idea Plane to spread its wings, as it were, in the measure of the needs of the new and deeper subjects attracting literary warrant from time to time. It has also created the insentive to cultivate the notational plane so as to implement all the findings in the idea plane.

3 Verbal Plane

It is difficult to separate an idea from its name, but they are mentally separable. The inevitable faults in the Verbal Plane mentioned in Sec 01 often eclipse the new developments in the idea plane. They go unrecognised for some time. When a new idea is isolated, the Verbal Plane is unable to provide readily a new word to denote it. This has delayed communication and often even distorted the

ideas just arising in the horizon as it were. International efforts are being made since the middle of the nineteenth century to minimise such obstructions to the development of classification theory in the Idea Plane. Currently, the Technical Committee 37 of the International Standards Organisation (ISO/TC 37) is actively promoting the formulation of the standard terminology for each discipline and in each language. The fruition of this endeavour is bound to take many decades. An ugly effect of the absence of such standard terminology in the schedules of many schemes for classification is seen in the loose verbiage used against Class Numbers -- particularly of Compound Subjects. But this can be minimised in the schedules of faceted scheme for classification, listing only isolate numbers and their equivalent isolate terms. The Canon of Context and the Canon of Enumeration, developed in the theory in the Verbal Plane, should be implemented in the construction of the schedule of Basic Subjects and each of the isolate schedules, remembered and used for interpretation, in the application of any schedule.

4 Notational Plane

41 Possibility of Mischief by the Notational Plane

The faults in the Verbal Plane often obstruct or at least confuse thinking and create abberation in the work in the Idea Plane. But it is possible to minimise this mischief of the Verbal Plane by a classificationist setting up one and the same seminal term for all equivalent ideas which may be denoted by different terms in a natural language, in the context of different subjects. This is particularly easy when the name of a Compound Subject is expressed in terms of its Basic Subject term and isolate terms. In a faceted scheme for classification, this is easiest; it almost becomes compelling if the classificationist has sufficient awareness. Such an approach eventually leads the classificationist to work with ideas -- to fix their helpful sequence -- with least dependence on the Verbal Plane. But it is not equally easy to escape the mischief of the Notational Plane inhibiting the thinking and the work in the Idea Plane to the necessary and sufficient depth; hence, the inability of many schemes for classification to keep pace with the continous development in the Universe of Subjects involving the throwing forth of newer subjects of greater depth, and isolates based on an increasing number of characteristics.

42 Faceted Scheme for Classification as the First Step in the Reduction of the Mischief in the Notational Plane

With its veneer of some facets and its invoking the aid of coloned numbers, UDC bravely manages to keep pace with the Universe of Subjects. But the virtual adoption of DC schedule for its cores, necessitates the frequent use of coloned

numbers. And the use of coloned numbers makes the Class Number unduly long, violating the Law of Parsimony in the Notational Plane. On the other hand, a fully faceted scheme for classification -- CC is an example -- is able to make its Class Numbers much shorter. For, instead of using a whole Class Number as a facet number, it is able to use short isolate numbers as facet numbers, For example,

Subject,- Paper chromatographic analysis of dyes
UDC number,- 668.811.014:543.544.42

(as given in the abstract 248/69 in the Hungarian technical abstracts,V.21,1969)

CC number,- F58:3C51

The number of digits in UDC is 22 as a result of using Colon Device, whereas in CC the number of digits is 8. A statistical analysis of 70 class numbers of a random sample of 70 subjects gives the average number of digits in UDC number as 18 against 12 in CC number.

In DC Ed 17 we can have only either "544.925 Chromatographic analysis" or "667.2 Dyes". This inhibits the Idea Plane for asking for a decimal class number fully expressive of the subject.

43 Length of the Base of the Notation and the Law of Parsimony

In UDC the Class Numbers of only four Main Subjects -- Philosophy, Religion, Linguistics, and Literature -- consist of a single digit; on the other hand, in CC Ed 6, the Class Numbers of 29 Main Subjects consist of a single digit, taking the term 'Main Subject' according to the consensus of academic practice today. This difference is due merely to the fact that the length of the base of UDC is 10, whereas that of CC is 35. Indeed, based on the indications of the theory in Notational Plane, Ed 7 (to be published in 1971) of CC uses a base of 59 digits.

44 Extrapolation in Chain

The theory in the Idea Plane demands extrapolation in chain. The decimal fraction notation, brought into wide use by DC, implements this demand admirably, in the Notational Plane.

45 Extrapolation and Sector Device

Till about 1955, there was no conscious provision in UDC for extrapolation of subjects in an array beyond the first octave -- namely, 1 to 8. But after that year the Octave Device, used in CC, is being generally adopted by UDC. The Octave Device can be repeated over and over again any number of times, that is, after each Octave. Theoretically this provides for infinite extrapolation in array. If the base is a mixed one, there is even a greater advantage. For example, if

the base consists of the 23 Roman smalls (excluding the letters i, l, and o), the 9 Indo-Arabic numerals (1 to 9), and the 24 Roman capitals (excluding the letters I and O), it is possible to call each of the ranges a to y, 1 to 8, and A to Y, a Sector.

We have to abandon the word Octave as more than 8 digits occur in the first and the third range. We may use each of the digits z, 9, and Z as a Sectorising Digit for the three respective ranges. Then by Sector Device, we can extrapolate any number of these Sectors after the first Sector in each range. However, viewed from the array as a whole it is a moot point whether it is a case of extrapolation or interpolation. Whatever we call it, the Sector Device increases the length of the array indefinitely. This extrapolation is necessary to satisfy the demand of the Idea Plane when a new subject or isolate appears at the end of any range of subjects or isolates -- range as determined by the first digit used in the number of the subject or the isolate, as the case may be.

46 Interpolation in Chain

The theory in the Idea Plane cannot deny the possibility of the need for interpolating a new link between two consecutive links in a chain. The theory in the Notational Plane has not yet succeeded to find any way of implementing this demand of the Idea Plane. This is now an unsolved problem to be pursued in the future. For the time being a classificationist seeks to minimise the probability for interpolation in chain. This he does by using his so called "Resolving Power" of the intellect with great circumspection to each stage in applying the Canon of Modulation.

47 Interpolation in Array and Emptying Digit

A new subject or a new isolate often appears. The theory in the Idea Plane examines its filiation with the already enumerated list of subjects or isolates, as the case may be. Sometimes it happens that the filiatory position is between two subjects or isolates, as the case may be, represented by numbers beginning with consecutive digits. For a long time the notational plane could not implement this demand of the theory in the idea plane. In defiance of this demand, the notational plane used to extrapolate such a subject or an isolate, as the case may be. But recent work in the theory in the notational plane has shown a way of implementing the demand of the theory in the idea plane. This way consists of setting apart a few of the last digits of the array as Emptying Digits. By 'Emptying Digit' is meant a digit which empties its preceding digit of its semantic value, but allows it to retain its ordinal value. The digit-pair consisting

of the Emptied Digit and the Emptying Digit has semantic value. It represents the subject or the isolate, as the case may be, to be interpolated between what is represented by the Emptied Digit alone and what is represented by its next consecutive digit in the array. For example, we can have K Zoology, KX Animal Husbandry, and L Medicine. The tradition in classification has been to include Animal Husbandry in Agriculture. This has been repugnant to the theory in the idea plane. Another way followed was to put Animal Husbandry in the miscellaneous basket of Useful Arts. This too was repugnant to the theory in the idea plane. The idea plane really wants that Animal Husbandry should be interpolated between Zoology -- the science of animal organism -- and Medicine -- the science of human organism, the most evolved of the animal organisms. The above illustration shows how the use of the Emptying Digit X interpolates Animal Husbandry between Zoology and Medicine in CC (8). In UDC 59 is Zoology and 61 is Medicine. 6 Applied Sciences is a partial comprehension and therefore it may be ignored. Therefore, if there is an Emptying Digit in UDC -- as it is not there we shall provisionally use X as an Emptying Digit -- the number 59X will interpolate Animal Husbandry in the right place. It was only in 1963 that the thinking in the theory in the notational plane hit upon this idea of Emptying Digit.

5 Idea Plane

51 Emancipation of the Idea Plane

The emancipation of the theory in the idea plane from the confusion caused by the verbal plane and the inhibition caused by the notational plane, led to the gradual free development of the theory in the idea plane. Its having developed the concepts of facets, phases, facets of different kinds (PMEST), and rounds and levels, have all been mentioned already. The theory in the notational plane has been valiantly developing itself to carry out all the demands of the idea plane.

52 Distinguishing of Modes of Formation of Subjects

The theory in the idea plane has begun to use its freedom in a thorough investigation of the modes of formation of Basic Subjects, Compound Subjects, and Complex Subjects.

521 Loose Assemblage

Consider the following examples:-

1 Mathematics for students of engineering;
2 Comparison of Physics and Chemistry;
3 Difference between Quantum Physics and Quantum Chemistry;
4 The Commerce of India studied with the aid of Statistical analysis; and
5 The Political principles of the Indian Government influencing the ownership of industrial enterprises.

The theory in the idea plane denotes the mode of formation of these complex subjects by the term 'Loose Assemblage'. In this mode of formation, a complex subject is created by Phase Relation between two simple or coumpound subjects, as the case may be. The examples given above show that the theory in the idea plane has isolated different kinds of phase relations. These are respectively Bias relation, Comparison relation, Difference relation, Tool relation and Influence relation. The underlined terms in the examples given above indicate these different kinds of phase relations. There can also be General Phase Relation.

522 Lamination

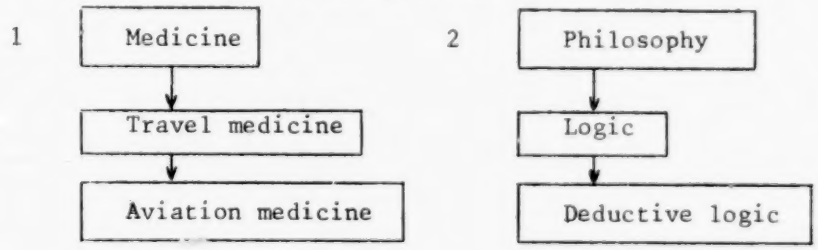
Consider the following example:-

In history, the functions of the President of India.

This is a compound subject. The theory in the idea plane denotes the mode of formation of a compound subject by the term 'Lamination'. In Lamination, isolates are attached to a Basic Subject in succession, in accordance with stated postulates and principles. In the example given above, "History" is the Basic Subject. "India", "President", and "Function" are the successive isolates attached to the Basic Subject. The first two are manifestations of the Fundamental Category Personality of Levels 1 and 2 respectively; and the third manifestation of the Fundamental Category Matter (Property). This is in accordance with the postulates on classification laid down by the theory in the idea plane.

523 Denudation of Basic Subject

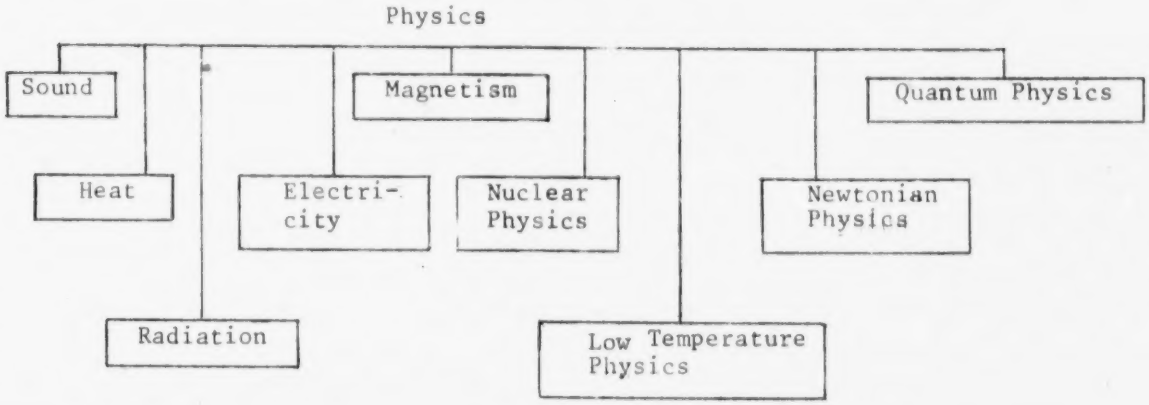
Consider the following examples:-



The theory in the idea plane denotes the mode of formation of each of these subjects by the term 'Denudation'. Denudation of a Basic Subject is formed by the successive subdivisions of one and the same Basic Subject into Basic Subjects of higher orders. The set of a Basic Subject and its successive subdivisions formed by Denudation is called a 'Chain'. Each subject is called a 'Link in the Chain' -- first link, second link, third link, etc. In the example given above, Medicine is the first link, Travel medicine is the second link, and Aviation medicine is the third link.

524 Fission of Basic Subject

Consider the following example:-



The theory in the idea plane denotes the mode of the formation of non-Main Basic Subjects in the second line from the Host Basic Subject "Physics", in the first line. This mode is called 'Fission', Fission was formerly denoted by the term 'Dissection'. Fission of a Basic Subject is formed by breaking down a Basic Subject into coordinate divisions. The Basic Subjects forming the coordinate divisions form an Array of Order 2, in relation to their common Host Basic Subject. In a similar way Basic Subjects of Order 3 can be formed by the Fission of Each of the Basic Subjects of Order 2 and so on.

525 Fusion

Consider the following examples:-

1 Chemical engineering;
2 Biochemistry; and
3 Medical jurisprudence.

The theory in the idea plane denotes the mode of formation of these subjects by the term 'Fusion'. The theory in the idea plane has recognised, in recent years, that two or more Main Subjects may get fused together in such a way that each of them loses its individuality in respect of the schedules of isolates needed to form compound subjects going with it. This results in a Fused Main Subject. Fused Main Subjects are gaining literary warrant in recent years. A Fused Main Subject may require its own schedules of isolates to form compound subjects going with it. Some of these schedules may be the same as those for the Main Subjects Fused together.

Even about half a century ago, what we now call a Fused Main Subject, began to appear in a vague and incipient form. Biochemistry was an example of this kind. But the theory in the idea plane was not able to understand its intrinsic nature or its distinguishing individuality for quite a number of years. As late as 1964,

a serious effort was made to understand their nature while preparing for the Rutgers' Seminar. But no clear results emerged. It is only during the last year, that a sufficient number of such subjects were examined together in an effort to find out their distinctive nature. Then it was possible to hit upon the idea of "Fusion" of existing Main Subjects as a mode of formation of a new Main Subject, now called "Fused Main Subject" (2).

526 Distillation

Consider the following examples:-

1 Museology;
2 Seminar Technique; and
3 Cybernetics.

The theory in the idea plane has recognised in recent years that a pure discipline is evolved as a Main Subject, out of the experience with its applied correlates appearing in-action going with different Host Basic Subjects, or occasionally even with Host Compound Subjects. This is said to result in a Distilled Main Subject. Distilled Main Subjects are now gaining literary warrant (1).

527 Partical Comprehension

Consider the following examples:-

1 Plant sciences, comprehending Botany, Agriculture, and Forestry, to be placed just before Botany.
2 Humanities, comprehending Mysticism, Fine Arts, Literature, Linguistics, Philosophy, and Psychology, to be placed just before Mysticism.
3 Religion and Philosophy, comprehending Religion and Philosophy, to be placed just before Religion.
4 Geography and History, comprehending Geography and History, to be placed just before Geography.
5 History and Economics, comprehending History and Economics, to be placed just before History.

The theory in the idea plane has been facing all along the problem of several Main Subjects sometimes being treated integrally or disjunctively in one and the same book. This is denoted by the term 'Partial Comprehension'. A partial comprehension has meaning only with reference to the Main Subjects recognised and enumerated in the schedule. What is now a partial comprehension might have been a Main Subject in very early days, before Fission advanced sufficiently. The term 'Partial Comprehension' is not used to denote a Main Basic Subject forming the Host Subject for Basic Subjects such as Canonical, Specials, and System Basic Subjects derived from it. Generally a partial comprehension attracts Periodical Publications, Encyclopaedias, and other Reference Books, and occasionally even ordinary books. Each partial comprehension should be placed in a proper filiatory position in the array of Main Subjects.

5271 Subject Bundle

Consider the following examples:-

1 Ocean Sciences;
2 Space Sciences; and
3 Soil Sciences.

The theory in the idea plane denotes these subjects by the term 'Subject Bundle'. The subjects included in a partial comprehension are intimately related -- that is, they have a high degree of filiation among themselves. But the theory in the idea plane also has recognised the need for accommodating a book comprehending subjects, without such a degree of filiation but at the same time get presented together in one and the same book. A combination of such subjects is denoted by the term 'Subject Bundle' (9).

Space sciences is a bundle of several disciplines, such as Ballistics, Electronic Engineering, Nuclear Engineering, Physiology, and Psychology all under conditions abnormally outside the range studied till now. The expert-groups in the several subjects have to work together at some stage as a team in mutual consultation. And yet, each expert-member in the team is a specialist only in his own subject-field. The subjects involved are all different. The professional training has to be different for the expert-members in the different subjects. Therefore, a book or a periodical giving the details of any one of these subjects will have to go with the other books and periodicals on it. At the same time, we are bound to have multi-focal books giving disjunctive or diffused accounts of many of these subjects taken together; or, we may have a book on this Subject Bundle, dealing with the details of the organisation and the inter-relation of the work carried out in mutual consultation by the different expert-groups, working as a team. It is only such books that will go into the Subject Bundle "Space Sciences".

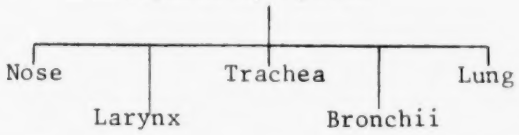
528 Versatility of the Notation

The theory in the notational plane has had to be developed sufficiently to make the notational system versatile enough to accommodate subjects formed by each of the above modes, in order to implement the findings in the idea plane. The theory in the notational plane has been valiant enough to meet this situation fairly well. But still there are some unsolved problems in the notational plane. The number of unsolved problems will depend on the way in which the already solved problems have been solved. The solutions of UDC and CC have been on different lines. Therefore, the number of unsolved problems in the two schemes will be different.

53 Mode of Formation of Isolates

Even a few years ago the theory in the idea plane realised that the following modes of formation of subjects can also be modes of formation in respect of isolates belonging to one and the same schedule:-

		Example
1	Loos Assemblage	Difference between rural folk and city folk
2	Denudation	Asia. India. Maharashtra.
3	Fission	Respiratory System



In the theory in the idea plane it is conjectured that the modes of Fusion, Distillation, Partial Comprehension, and Isolate Bundle are not likely to arise in respect of isolates.

6 Compound Isolate

61 Initial Drifting

The theory in the idea plane has been all along vaguely sensing the possibility of a mode of formation in respect of isolates in one and the same schedule, corresponding to lamination in respect of subjects. But cases of this kind have been denoted by different terms and represented by different notational devices in successive years. The design of schedules for depth classification came to be practiced extensively since 1964. This brought up cases of this kind more profusely than before. The theory in the idea plane was, therefore, obliged to settle this problem in a stable way.

62 Law of Parsimony

The schedule of personality isolates, likely to go with the Basic Subject "D8 Production Engineering", includes the enumeration of the following isolates. At the same time we have documents on "Production Engineering", presenting the following as personality isolates:-

Screw
Screw with friction grip thread
Screw with high strength
Screw for steel work
Screw for structural work

But there are documents involving:-

1 Screw qua Screw;
2 Any one of the last four of the above-mentioned isolates;

3 Any two of the last four of the above-mentioned isolates;
4 Any three of the last four of the above-mentioned isolates; and
5 All the four of the last four of the above-mentioned isolates.

Thus, the theory in the idea plane demands provision for 16 isolates. In an enumerative scheme the schedule will enumerate all these sixteen isolates. Such a full enumeration for all the schedules, going with all the Basic Subjects, will swell the volume of schedules enormously. This will certainly violate the Law of Parsimony; it will also cause inconvenience in the use of the volume of schedules.

63 Solution by Analytico-Synthetic Method

The theory in the idea plane indicates that it is possible to satisfy the Law of Parsimony by adopting the analytico-synthetic method used in the case of compound subjects in a faceted scheme for classification. In the present example, it is sufficient to enumerate the five isolates mentioned at the beginning of Sec 62. The other combinations of isolates can be formed by "combining" these scheduled isolates, to the extent warranted. The result of the combination is denoted by the term 'Compound Isolate' (3). It must be stated that a compound isolate is different from a complex isolate, formed by inter-facet phase relation between isolates in the same schedule (10). We use the term 'Combination' of isolates instead of the term 'Lamination' to avoid the use of this term in two different senses. To implement this suggestion of the theory in the idea plane, the theory in the notational plane should provide a digit corresponding to Indicator Digits used in Lamination, but different from them. Further, this new digit should have a higher ordinal value than any of the digits used for Lamination. The notational plane has provided the digit "-" (hyphen) in CC. It can also do something similar in UDC.

64 The Sequence of the Assemblage of Component Isolate

The solution suggested in Sec 63 will work well if there is a definite prescription for the sequence in which the component isolates are to be combined. The theory in the idea plane suggests the following methods:- "Arrange the isolates in the schedule according to the reverse of the sequence suggested by Wall-Picture Principle. Then combine the isolates in the sequence reverse of the sequence of their occurrence in the schedule".

65 Exception 1 to the Prescription in Sec 64

There may be occasions when the combinations in the two sequences AB and BA may have distinct meanings. Then, they must be combined according to the meaning.

66 Exception 2 to the Prescription in Sec 64

Consider the example:-

"Muscle of the Eye"

According to the schedule for "Organs" given in CC, these two isolates should be assembled in the sequence "Muscle - Eye". But if the opthalmist prefers the sequence "Eye - Muscle",this preference should be followed in contradiction to the prescription in Sec 64. An alternative is to reconsider the sequence of the isolates in the "Organ" schedule, examining whether the isolate "Eye" should be listed later than the isolate "Muscle". The pursuit of this suggestion bristles with certain difficulties.

67 Special Component for Compound Isolate

Consider the following block of 24 isolates in the schedule of Personality isolates in "P Linguistics" in CC:-

Vowel	Back vowel
Close vowel	Close back vowel
Half-close vowel	Half-close back vowel
Open vowel	Half-open back vowel
Nasal vowel	Open back vowel
Nasal back vowel	Front vowel
Mixed vowel	Close front vowel
Close mixed vowel	Half-close front vowel
Half-closed mixed vowel	Half-open front vowel
Half-open mixed vowel	Open front vowel
Open mixed vowel	Nasal front vowel
Nasal mixed vowel	

On the other hand, by using the concept of compound isolates the following few schedules of isolates and special components making a total of 9 isolates will prove sufficient.

Isolate	Special Component
Vowel	Close
Back vowel	Half-close
Mixed vowel	Half-open
Front vowel	Open
	Nasal

Surely, the latter plan satisfies the Law of Parsimony in respect of the length of schedule.

68 Reason for the Term 'Special Component'

Each of the items in the column headed "Isolates", can by itself be an Isolate. But non of the items in the column headed Special Component, can by itself be an Isolate. They can only occur as a second component in a compound

isolate. It is for this reason they are called "Special Components" (4). Investigation on this is in active progress to find out the places needing a schedule of special components.

7 Need for Theory-Based Scheme for Classification

71 Rate of Growth of the Universe of Subjects

Till the beginning of the present century research workers were relatively few. The motive for research was largely the inner urge in them. Therefore, the rate of growth of the Universe of Subjects was relatively small. Any new subject thrown forth could be given a filiatory place and could be represented by an appropriate class number, in a rule of thumb way or with some degree of flair. But research soon passed on from the sphere of a single gifted man to a team of workers. Naturally, this accelerated the growth in the Universe of Subjects. Very soon its rate over-powered mere rule of thumb and flair in deciding the filiatory position of every new subject among the already existing subjects, and in determining the class number of a new subject in such a way that the filiatory position is respected and secured. This was the cause for attention being turned on to the theory of classification in the idea plane and in the notational plane respectively. Though not all, at least a few classificationists felt the need for basing their work on a dynamic theory. The development of the theory was, however, slow. This was due to the libraries confining their service to the feeding of readers only with the macro subjects embodied in books coming out at a relatively low speed.

72 Effect of Industries being Based on Theory

About three decades ago, the industries found it necessary to improve their work with the aid of theory. Consequently, industrial research emerged. Industrial research involved both pure and applied research. Moreover, as a profit making body, an industrial enterprise wanted a quick absorption - almost amounting to the instantaneous absorption - of all the new results of research. This involved feeding the research workers with micro subjects embodied in articles in periodicals. In its turn this made it obligatory to take classification to a deeper level. This demand became quite extensive since World War II. In other words, depth classification became necessary to classify the micro subjects embodied in articles in periodicals. This required a deeper theory for classification in the idea plane as well as in the notational plane. Moreover, articles in periodicals appeared at a very much greater speed in very large numbers than books. In

other words, the Universe of Subjects is being deepened and extended at great speed. To meet this situation, classification had to be continuously improved -- at a far greater speed than in the earlier years. Here, rule of thumb and flair began to fall totally. Any persistence in dependence on them led to chaos, instead of the cosmos expected of classification. Guiding principles for the development of a scheme for classification had to be formulated and improved upon almost continuously in the form of a dynamic theory of classification both in the idea plane and in the notational plane. Failure to do so resulted in a considerable loss to the industrial enterprises. Therefore, industrial houses themselves are coming forward to provide considerable support to the development of the theory of classification as an advance guard, and to the quick and nearly unerring development of depth classification based on theory. Association of Special Libraries and Information Bureau (Aslib) is an example at national level, and International Federation for Documentation (FID) is an example at the international level. The Documentation Research and Training Centre (DRTC) is an example of Government support. It is hoped that the industrial houses also will come forward to give financial support to the work in the DRTC, as it is already happening in the Aslib and in the FID.

73 Atomisation of Commodity Production

Of late, taking classification and the theory of classification to still greater depth is being stimulated by a new trend in commodity production. This trend may be described as "Atomisation of Commodity Production".

Let us begin with a homely example. Let us consider food production. About 70 years ago, when I was a boy, our village had about a hundred families. Each family owned its own fields, itself prepared the necessary manure, grew paddy and pulses, had its own cocoanut trees, tamarind trees, fuel trees, and kitchen garden. The family itself husked the paddy, cured, and split the pulses; and made flour of them. Al such ingredients were used in the kitchen of the family, and food was cooked. The family had its own cow and buffalo. Milk, butter, and other dairy products were made in the family itself. This sma scale work was guided by tradition, needed little research, and hardly depended on any document, and the question of classification did not arise. What is happening today?
As an illustration:

1 Some persons specialise in fertilizers;
2 Some specialise in cultivating and harvesting work;
3 Some specialise in producing tractors;
4 Some others specialise in producing insecticides to save the crops;
5 A few in producing better strains of the different varieties of crops;

6 Some others in making flour out of the grains;
7 Some in dairy work; and
8 Some in vegetable gardening.

Each of these commodities are produced on a large scale and their production is continuously improved upon by research. The research multiplied subjects and documents; depth classification became necessary and research in the theory of classification became an unavoidable corollary.

731 Pattern of Modern Industrial Production

The family buys all necessary commodities, and reduces its own kitchen work to a minimum.

The Central Factory designs and specifies the process somewhat as follows:-

1 The trend in the production of any commodity today is different kinds of the ultimate parts of the commodity being produced;
2 It leaves the production of each ultimate part for an auxiliary industry of its own;
3 It then collects the ultimate parts from the respective auxiliary industry
4 It tests their quality and their conformity to the prescribed standard and specification; and
5 It assembles them into the final commodity, making slight amendments of the parts, wherever found necessary.

For example, a wrist watch consists of about 120 different kinds of parts. The production of each such part is now left to the care of cottage industries in the villages. The main work of the watch-maker is the assembling of these parts. Similarly, an aircraft requires a few thousands of ultimate parts; and a motor car, a few hundreds. The production of each part is already left or will soon be left to an auxiliary producer. This is what is meant by Atomisation of Commodity Production.

74 Atomisation of the Subject of Industrial Research

A consequence of the atomisation of commodity production is that the subject of industrial research also gets atomised. An auxiliary industry concerned only with a particular part builds up a vast experience in respect of that part. This leads it to make continuous improvements in the part through specialised research. For example, in May 1958, I visited Mangalore, where I had started teaching in 1917. I found one of the students of the first batch, specialising in making springs for transport vehicles - be it a locomotive engine, or a railway carriage, or a motor truck, or even a horse carriage. He and his son had developed several new techniques in this field. Such a thing could not be even dreamt of in 1917. Least did I then expect that one of my students in the senior intermediate class would become a specialist of such a severe kind. Any-

how, it indicates the modern trend in specialisation.

In 1969, I also found in the Patel Vidyapith (University) in Gujarat, specialisation in making fences. They were supplying these fences to the different railways and to several other organisations. This Centre was developing new techniques in the subjects connected with the production of fences.

This is what I meant by Atomisation of the Subject of Industrial Research.

75 Articles on Atomised Research

The results obtained by such atomised research are now published in periodicals. Atomised research concerns not only production engineering but also maintenance, marketing, and problems of management, on a large scale. Some subjects in atomised research maintain their own periodicals to publish their articles.

Example:

Periodicals

1 Metal treatment and drop forging;
2 Solid state electronics; and
3 Sugar molecule.

Abstracting periodicals

1 Semiconductor abstracts
2 Lead abstracts
3 Metal finishing abstracts.

In the case of some atomised subjects, the articles are scattered in periodicals in one or other of connected subjects. If a specialist, making research in the subject concerning a particular part of a commodity, is not fed with the latest ideas having a bearing on his subject field -- however narrow -- his research time will be wasted. Or, the producer of the commodity concerned will be using outmoded techniques. This will lead to a shrinkage in his market and an ultimate decline in the success of his business. This phenomenon is not peculiar to commodity production alone. It is developing in business management and in the running of Government Departments. About five years ago, the Home Ministry of the Government of India had realised this phenomenon. One of its Deputy Secretaries came to the DRTC alone with a librarian of the Ministry to discuss the ways and means of feeding the Officers with the latest or the nascent ideas appearing in articles on the field of the work of his Ministry. This sensitiveness to the reality of the situation and readiness to cut off from the old ways filled me with a sense of joy and of hope for the future of humanity.

76 Impact of Atomisation on Library Techniques

The library profession realised the demands, on its own techniques of

1 Atomisation of commodity production, and of the processes in the business and Governmental management;

2 Atomisation in the fields of specialised research;

3 Abundance of specialised articles on nascent ideas on minute subjects, flooding the libraries through periodicals;

4 Inadequacy, for service in specialist libraries, of the older library techniques developed for generalist libraries including the academic libraries of the past;

5 Continuing research in library techniques to organise and to serve specialist readers with articles containing the latest or the nascent ideas in their respective fields of work;

6 Application of these everchanging new techniques in the preparation of documentation lists and in the facet analysis of reader's queries in the course of the trilogue between the reader, the documentation list, and himself; and

7 Advanced training to enable a specialist librarian -- denoted by the term 'Documentalist' -- to give adequate service to specialists in industrial and academic research organisations and in Government Departments.

77 Effect of Atomisation on the Theory of Classification

To effect such a service to the specialist, the scheme for classification should be continuously deepened and enlarged. To do this frequently and without waste of time classification should be based on a sound theory both in the idea plane and in the notational plane. The development of such a theory itself calls for continuous research in its own field. Such is the ultimate effect of the proliferation of the Universe of Subjects, at a tremendous rate, on the theory of classification. It is in view of this that the FID appointed in 1950 a Special Standing Committee of Research in the Theory of Classification (FID/CA), it is now named FID/CR. Its work will have to be intensified in future, both in the theory in the idea plane as well as the theory in the notational plane.

8 Advent of Electronics

Electronic engineering has begun to throw a challenge to the theory of classification. At present, the general purpose electronic computer is used for document search. India is advocating the design of a special purpose electronic aid for document search; it has named it "Doc-Finder" (6). While the computer's main work is to calculate, and it is being forced into document search, the Doc-Finder's only purpose will be to establish one-one correspondence between the specific need of a specialist at the moment and the

documents recorded in the memory of the Doc-Finder. This special-purpose Doc-Finder will involve a considerably less capital and working expenditure, than a general-purpose computer. But to make the money invested in the Doc-Finder and its working pay itself back and preferably pay more than itself, the depth classification should make the work of the Doc-Finder leakage-proof and noise-proof. This means continuous sharpening of the depth classification. In its turn it means the continuous dynamic growth in the theory of classification in the idea plane as well as in the notational plane. Thus, the Doc-Finder is not going to enable the classificationist or the classifier to rest on his oars. On the other hand, it will make him work even more than ever before. This should be realised by the library profession and particularly by its specialised branch, called the professional documentalists.

9 BIBLIOGRAPHICAL REFERENCES

Note.-

1 The following is the list of documents used.
2 Column 1 gives the serial number of the documents included in it.
3 Column 2 gives the number of the section in the text, where the reference to the document occurs.
4 All the documents are by S.R. Ranganathan.

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2 Sec 525 --. (--. Sec 6).

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